

AVIATION WEEK

A McGRAW-HILL PUBLICATION

JAN. 1, 1951

\$6.00
A YEAR



Claws for the Ground... Teeth for the Sky

The Grumman turbo-jet PANTHER, like its feline namesake, strikes swiftly and deals destruction with claw and fang. At low-level its rockets and bombs rip enemy ground installations. High in the sky, this proved Navy fighter uses its teeth! Recently over Korea, at an altitude of six miles, Red jets felt the bite of PANTHER machine guns for the first time. The bite was fatal.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE, L.I.

Contractors to the Armed Forces

B.F. Goodrich

BREAKING
HER OWN
WORLD
RECORDS

The Air Force's Convair-built XC-99 transport, with no more world cargo marks to break except her own, continues to set new records that no other aircraft can approach.

The conflict in Korea has proved unequivocally that battles and even major campaigns can be lost if critical materials are not available immediately after an aggressive strike.

Commitments by the United Nations to stop aggressors throughout the world emphasize the desperate need for high-capacity, long-range air-cargo-carrying aircraft that can transport vast amounts of materiel where and when they are needed.

Only the C-99 can speed more than 100,000 pounds of weapons or supplies anywhere in the world in time to meet the initial thrust of an aggressor.

IN THE AIR — IT'S
CONVAIR

CONSOLIDATED-VOLTAIR AIRCRAFT CORPORATION
SAN DIEGO, CALIFORNIA
FOOT MILEAGE TEAM



4 hot ideas for fighting ice

The pipe that flies like a plane

Design a new Flying Boom for a fighter escorting (upper left) is seriously frozen into place by means of ice-shaped rod devices. As pounds increase control, these moderators had to be precision-ignite ice. B. F. Goodrich developed special electric rubber pads for the lead-edged rod supports and strengthened

Electric blankets keep new Arctic plane from freezing Designed for Arctic rescue work, Northrop's new C-125 (upper right) had to have an protection until real upon BFG electric rubber "blanket" covered the truck for drama part—separation, electric heat and ice release. Because of the design feasibility of electric rubber, wide vari-

ions in the shape of these three pads proved no obstacle.

Keeps ice from shaking jets

A threat. Ice forming in the narrow throat of a jet engine nozzle could choke off the air supply, make the engine quit cold. This danger has been eliminated on North America's B-57 (lower left) with a special lining of BFG electric rubber inside the nose.

Rubber makes gasoline stretch

To help flight engineers offset fuel supply for maximum efficiency, a hydraulic line connects propeller lead to an auxiliary power unit. The cold was congealing the oil, causing line restriction. BFG engineers theorized the hydraulic line an electric rubber to keep

the oil fluid, not gasoline. This heated line is now installed on TWA Constellation (lower right).

B. F. Goodrich electric rubber is tough, thin rubber with a core of non-toxic wax that provides spot heat precisely as needed. Two lead wires stretched to the airplane's regular power supply are the only other equipment required. Electric rubber can be made to fit any size, any shape, anyplace you want. For help with your problem write to The B. F. Goodrich Company, Akron-Salem Division, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER



**FOREMOST IN
SCIENTIFIC DEVELOPMENT**
**IN THE REALM OF FORGING
DESIGN AND THE DEVELOPMENT
OF PROPER GRAIN-FLOW, WYMAN-
GORDON HAS ORIGINATED MANY
FORGING DESIGNS WHICH AT THE
TIME OF THEIR DEVELOPMENT
WERE CONSIDERED IMPOSSIBLE
TO PRODUCE BY FORGING.**

WYMAN-GORDON
ESTABLISHED 1888
FORGINGS OF ALUMINUM - MAGNESIUM - STEEL
WORCESTER, MASSACHUSETTS
DETROIT, MICHIGAN

NEWS DIGEST

DOMESTIC

Forty-ninth contract was signed by United Airlines Standard division of United Aircraft Corp. and Lodge 703 International Assoc. of Machinists after more than one week's negotiation. Contract provides 14-months' worth of certain 3-cent hourly cost-of-living allowances and to Dept. of Labor's Cost Survey. Four Index, 4-cent hourly increase for compensation, increased around-shift premium and revised group insurance program.

Lear, Inc., Grand Rapids, Mich., has been awarded additional Air Force contracts for the company's T-5 autopilot and automatic approach complete (see p. 35). These contracts, totaling more than \$1-million, increase Lear's backlog to over \$25-million. Minneapolis-Honeywell Regulating Co. has signed a three-year licensing agreement with Lear, Inc., to manufacture both the Lear T-5 autopilot and vertical stabilizer damper for the Air Force's T-38. First unit completed delivery to Navy is last of several recently modified planes equipped with automatic landing and cruise control systems.

Lockheed Aircraft Corp. has leased facilities of Polandair Aeroplans in Lublin, Poland at a Polish port. Runways at Polandair are to be lengthened to 12,000 and 13,000 feet.

Link Aviation, Inc. has announced that it has received a letter contract from the USAF for building trainers simulating the Boeing B-47. Total value is approximately \$1 million. Deliveries are scheduled for late in 1957.



AIRBUS'S PRESIDENT E. W. Richardson (left), who manages the Aviation Products Div. of Goodyear Tire and Rubber Co., was elected president of the Aviation Division and Manufacturers Assn. at its recent Los Angeles convention. With Richardson are CAA Administrative Board Member G. B. Van Dusen, acting president of AIAA and president of Van Dusen Aircraft Supplies, and J. S. Merle, CAA Regional Administrator, 6th Region.

Adm. Ernest S. Land, president of the Air Transport Assn., is outgoing that post effective Dec. 15, 1957, author Dec. 31, 1958 as reported here last week.

Air Transport Assn. has approved application for membership from Central Airlines, Inc., Dutch Air Lines, Inc., and British Airways, Inc., bringing its total membership to 40 airlines.

Ryan Aeromarine Co. has a current backlog in excess of \$25 million, representing both aircraft and engine components. Among the latter are jet engine parts for General Electric and Pratt & Whitney and Douglas.

Titan World Airlines has placed flight order for Colgan Radio Co. Type TH-3 VHF transmitters. Colgan has previously sold 30 pre-production sets to acceptance aircraft overseas, plus an additional 250 sets in present production run with delivery scheduled for February or March.

INTERNATIONAL

South African Airways has sold four facilities of Polandair Aeroplans in Lublin, Poland at a Polish port. Runways at Polandair are to be lengthened to 12,000 and 13,000 feet.

South African Air Force has decided to obtain 16 more de Havilland Venoms jet fighters, double the present number in service.

Lockheed has signed a long-term contract with the Royal Canadian Air Force for 100 F-104 Starfighters.



E. W. RICHARDSON, president of the Aviation Products Div. of Goodyear Tire and Rubber Co., stands with a model of the new Boeing 727 aircraft he helped develop. Richardson is considered by many to be one of the most creative minds in the aerospace industry.

NEW

**ROTORETTE
LOAD SENSITIVE
ROTARY ACTUATOR
with
ADJUSTABLE
POSITIVE
STOPS**



Here is one of the most compact and reliable solenoids meeting all military requirements—the ROTORETTE adapted for applications on the F-100, F-105 and F-4C. It is a sleekly built solenoid for combat aircraft. Construction and design are such that one panel's access to one assembly where space is limited.

Longer solenoids are also available and suitable for use up to 30 positions. Both standard and special models are constructed to economically provide positive stops, permitting a one-dimensional load limit function.

Operating on 26 volts D.C. the ROTORETTE is a reliable, compact solenoid which can accommodate either a piston levering mechanism or an intermediate position switch. Both methods are qualified for compliance to Specification AFH 86-60 (Mines and Boats including Fleet), USAF-1185 (Interim) or complete aeronautical and USAF-62104 (General Bureau-Mechanical Acceptance Specifications).

Write for Bulletin 128.

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The 25,000 lb. XC-123 required only 500 feet of runway for its initial takeoff—comes to a stop in seconds after landing—positive proof of performance capabilities!

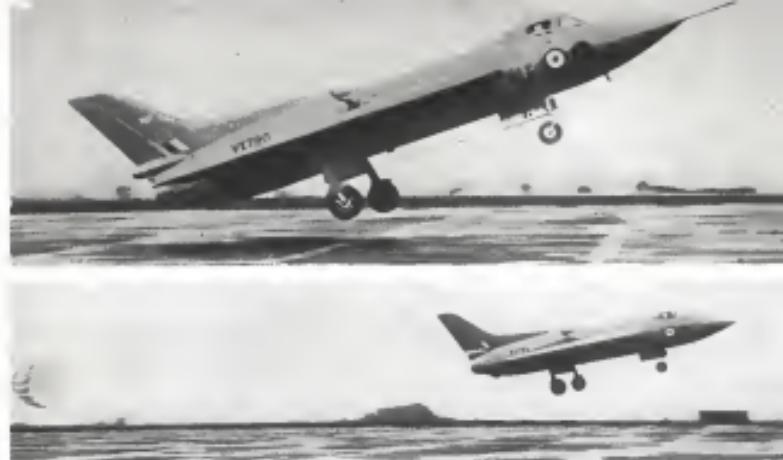


AVIATION CALENDAR

- Jan. 3-7, 1961—Munich Aviation Week, Munich, West Germany.
- Jan. 3-6—Third annual Kansas aerial survey meeting, sponsored by the Kansas State College, Manhattan, Kan.
- Jan. 6-7—Hawks Air Fleet Assn. air show and exposition of planes and equipment, City Lanes airport, Miami, Fla.
- Jan. 8, 9, 13-14, 1961—Midwest meeting hosted by the Northern California Chapter Assn. of Weathermen, Angwin, Wash. Feb. 1-3, 1961—annual conference, Wien Springs Airport, Wien Springs, Calif.
- Jan. 8-11—Eight annual air census Minnesota, and return of Fleets Air Fleets Assn.
- Jan. 8-12, 1961—annual meeting of the Society of Automotive Engineers, Hotel Knickerbocker, Detroit.
- Jan. 9-12—Third annual Institute of Industrial Transportation and Traffic, Washington, D. C.
- Jan. 10-12—annual maintenance, shop and maintenance conference on jet maintenance techniques, Cleveland, Ohio.
- Jan. 21—An education day, sponsored by the Palm Springs Junior Chamber of Commerce, Palm Springs Airport, Calif.
- Jan. 23-26—Winter general meeting, Association of American Engineers, Hotel Statler, New York.
- Jan. 23-26, 1961—11th annual meeting of the Institute of Aeromedical Sciences, Hotel Astor, New York.
- Feb. 12—Annual spring management conference, sponsored by the Society for Management of Manufacturing, North Western University, Chicago Campus, Medinaville University, Chicago.
- Feb. 19-20, 1961—Meeting, covering agricultural research as related to aviation, sponsored by the Flying Farmers of America, Miami, Fla.
- Mar. 15-18—Short course on uses of aerial equipment in agriculture, Franklin University, West Lafayette, Ind.
- Mar. 16-18, 1961—annual flight propagation meeting, sponsored by the National Research Center, Cleveland.
- Mar. 18-21—Fourth Western Metal Exposition, Oakland Auditorium and Exposition Hall, Oakland, Calif.
- Apr. 24-26—ATA annual engineering and maintenance conference, Hotel Drake, Chicago.
- May 12-14—Annual convention of the Women's Aerospace League of the U. S., Little Rock, Ark.
- June 15-18—Second annual conference on industrial automation, conducted by Colgate University Dept. of Industrial Engineering, New York.
- June 19-July 1—International aviation display, Grand Palais and Le Bourget Air port, Paris.
- Sept. 7-11, 1961—Third annual Anglo-American Aeronautical Conference, convened jointly by Royal Aeronautical Society and IAS England, England.

PICTURE CREDITS

- The Chase photo: 149, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172—Courtesy Chase Aircraft Co.; 163—Courtesy National Aero. & Space Admin.; 164—Courtesy Bell Aircraft Corp.; 165—Courtesy Hiller West Africa.



AVRO TUDOR, British transoceanic search craft (AVIATION WEEK July 9, 1960), demonstrates two landing techniques. Upper photo emphasizes near-high altitude characteristics of de-laminated plane. Lower shows use of open chute in drag brake.



BREGUET 765, wearing the colors of Air France, is a fast jet version of their famous freight and passenger transports. Center in its long tilted nose prototype flew



MIG-17F FULCRUM in recognition livery of this Russian intercepting fighter (AVIATION WEEK Nov. 13, 1960). Photo shows high, short sweep, wing and (possibly) canards under nose fairing

New Pictures of Foreign Planes

—BELL D-500—France's Breguet 50-H.C. swept-wing version has made two successful flights of standard range, one fitted with two 450-hp. engines, one with a single 610-hp. engine.



—BELL D-500—France's Breguet 50-H.C. swept-wing version has made two successful flights of standard range, one fitted with two 450-hp. engines, one with a single 610-hp. engine.

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WHO'S WHERE

In the Front Office

Ralph J. Gaudino has been elected president of General Electric's aerospace division. Charles F. Wilson who has been appointed chairman of the new Defense Mathematics Board. Gaudino, who has been with GE for 24 years, was most recently vice president and a director since 1949. During the last two years he has directed growth of the production scheduling and cost division at Waltham, with GE's 31 year because just prior to 1949. He served with Waltham from 1942 until 1944, becoming executive vice president in 1944.

Leroy L. Rabb has been appointed as acting to the president of Stevens Warner Corp. With the firm since 1925, he has been production control manager at the Indianapolis and Indianapolis assembly divisions since 1942.

What They're Doing

A. H. McComb, director, military division of the International Civil Aviation Organization has left ICAM to take a government post in Ankara. McComb was one of ICAM's original founders.

John Armstrong, himself was president of the company from 1934 to 1940. Armstrong has joined the North American staff of the Ransome, Inc., public relations counsel. He will handle the Pepe Coda account.

Ben Wright has stepped in director of public relations of American Airlines as successor to James F. Field, system manager. He joined American in 1934 and became manager of public relations in 1956. Earl Lee has stepped in as managing director with AA after the death of several.

Robert C. Shandow has left North American Airlines to set up his engineering firm, the Design Engineering Co. Inc., located, Dearborn, Mich. 16th. Club, which will do design and engineering on contract to the customer.

Champions

R. E. Beck has been made general sales manager of Vultee, Inc. Beck has joined the company from the management division of General Mills. Harry A. Yost has been appointed manager of manufacturing of General Electric's Vultee and Lockheed division at Louis, Tex. Donald M. McGehee has been made general manager of the West Coast division at Burbank, Calif.

Percival P. Bush, Jr. has been appointed permanent sales representative for Pan American World Airways. Mihaly dezsos has been named manager of general wire development in TWA.

Humors and Elections

Ralph E. Crast and Donald Douglas, president of Lockheed Aircraft and Douglas Aircraft, respectively, have been made Chevaliers of the French Legion of Honor.

Peter H. Redpath, vice president in charge of sales for Comptel, Ltd., has been awarded the Royal Order of Knight of the Thistle by the King of Denmark.

INDUSTRY OBSERVER

West coast sources say that North American Aviation's first turbojet plane will be a new heavier version of the North American AJ aircraft. It will have a new engine, the Pratt & Whitney J-57, with two Allison T-40 turbojet engines. It does not carry the turboprop engine in the tail, which the earlier AJ's use.

Plans of the R.A.F. de Haanland-Vanuatu recently completed a ferry delivery flight of approximately 9000 miles from Britain to Singapore, crossing the distance of approximately 1500 miles and arriving within 7 hours of estimated travel time, on what is claimed to be the longest jet-fighter delivery flight made by any air force.

At Coronado Sea Base has embarked on a program of "steaming" workers in preparation for release production orders of "new" bananas. This presumably means a stoppage of scheduled production of the Current XPS-1 (RIV) biplane flying boat now undergoing flight tests.

At Research building has climbed from \$15 million to \$15 million in the last 60 days. Company officials state it is a result of post-Korea orders to prime contractors. The company is building up its subcontract load as rapidly as possible and expects to have a third shift operating by Feb. 15. Another facility, which would considerably ease mounting work loads, is not expected for completion until next June if all goes well.

AMC contractor experts predict replacement of showrooms with business in many locations in three to five years. Some Washington experts are more sanguine, holding that refurbish may be accomplished within the next two years, depending on various expanding materials needs during that period.

First Republic P-47 equipped with the British-built 2700 lb thrust and then Supermarine jet engine will be tested Feb. 1. About 500 of these aircraft have been ordered from Armstrong Siddeley for installation in Folland. First purchase was made to prevent proliferation and testing of Supermarine powerplants before Curtis Wright can get into production with U.S. venture.

At Air Force request, negotiations between Republic Aviation Corp. and General Motors Corp., for manufacture of the Republic P-47, are under way. USAF representatives to North Atlantic Treaty nations for P-47s have heavily insisted production schedules everywhere. This year about 1000 Thunderbolts are scheduled for delivery to NATO nations. Programming includes delivery of more than 900 by Jan. 1, 1953.

Two of Britain's latest jet fighters, the Venoms and the Hawker P.1031 jet fighter, will be flying later this month to improve performance and durability of the jets at very low and very high altitude speeds. Equipped with the same of the best U.S. experimental jet pilots, the fighters will test airflow over cockpit wing tip slots. Air entering along the edge of the wing through the wing tips creates a dangerous wing tip stall effect.

French Fouga Camau is ready to be fitted with its two Hispano jets which are to be delivered shortly. Test flights are scheduled currently.

Both Rolls Royce, British 6200 lb thrust multistage turboprop, is to be built in France under license to the Hispano-Suiza company. French sources say that the Turborepulsion is almost the same as that of the RR Nene, also being built in France, and that Hispano-Suiza hopes to increase the thrust of the Turborepulsion to 6600 lb.

Washington Roundup

Senators Ask Why Stall Full Mobilization

• Defense Department seems content to build "Base" from which production could be quickly expanded in 1952.

• But Appropriations Committee members think it's not that easy—that labor wouldn't be trained, for one thing.

• So they want haste, even at the expense of waste, and wait for a chance to jump through defense hills.

By Katherine Johnson

Is there a war emergency? That's what members of the Senate Appropriations Committee are continually asking after listening to testimony of such tiny Indians from Secretary of Defense George Marshall down the line. The Indians softs down to that.

The Joint Chiefs of Staff have set a new "target date" of 1952. Intelligence reports indicate that at the present, the U.S. cannot be prepared for alliance war with Russia, probably a global-waged war.

But Department of Defense has no inclination to hold up to war strength to meet that challenge. It wants only to be ready only "in case of emergency, well-prepared," according to 1952. Sen. Joseph D'Amato has been consumed. "All they have in mind is getting some sort of platform from which they could expand to war strength at some time in the future." But the U.S. is running out, and we're still adding flying into other mobilizations, and the Russians gain on us. I want to start."

► Springfield—From the "base," the Encinoites emphasize it could, over eight years, run full war strength. But the Committee members say skeptical. If we should come in 1952, the same 4 million men that would be made ready under Defense Department's program would be fighting. They wouldn't be here to man the about 5 million additional aircraft intended to be needed for a major war. Marshall's proposal that additional effort could be added to production is being urged. From a standpoint of a thousand basis it isn't regarded as realistic. Witness or not matched and turned over night. Congressmen say.

Quarantine showed Senate traps to be the carbon taff, that passes

expect to before February.

Until then, U.S. defense will fall as an out-of-date program down when visitors for UN forces learned in Korea and the outlook was far from so defend itself of armed truce between the U.S. and Russia.

► Who Helps—Since the President has declared a war emergency, congressional leaders ask why military leaders talk at meetings with all its ramifications, including those

• Flight-deck aircraft carrier. The Navy claims it would be if it is to be built. High-powered aircraft gets the job, but the government is not for it. But Navy doesn't plan to get another one equipped for loads for a prototype until next spring. On the side of optimism, this means that it will be 1954 before any flight deck will be in existence.

• Naval aviation. While UN forces were winning in Korea, aircrafts not fail in a 45-plane deficiency in the aircraft procurement program for the year. Despite the retreat in the Far East and the darkening world picture, Navy hasn't gotten around yet to adding another flight deck for the carrier.

• Naval Ordnance. Since Commandant of the Corps, Gen. Clinton Cates, caused a smash of 34 air squadrons before the Chinese Communists on strength in Korea. He has now succeeded in getting the green light for a buildup to 18 squadrons—only 7 are already. Out of the full array of military leaders who testified before Congress over the past three weeks, Cates was the only one who emphasized difficulties with the strength buildup.

• Tankers. Although USAF is building up its tanker fleet, with 40 tankers flying USAF effects according to a Senate source, "Advises they have no plans now that will give the combat forces the plane protection that they will need in combat."

► New Goals—Goal of the 11 member nations of the North Atlantic Treaty Organization is a rapid build-up to 55,000 aircraft or group based in Europe for each army division. The program was agreed to by NATO's top policy group of foreign ministers at the Brussels meeting.

Most of the aircraft will have to be supplied by U.S. manufacturers of them to be in European form in being by 1952. Total of \$350 million in Mutual Defense assistance program

is to be given to Britain.

Until then, U.S. defense will fall as an out-of-date program down when visitors for UN forces learned in Korea and the outlook was far from so defend itself of armed truce between the U.S. and Russia.

► Who Helps—Since the President has declared a war emergency, congressional leaders ask why military leaders talk at meetings with all its ramifications, including those



GUNS ARE LOADED with 30mm shells.



GUNS ARE SIGHTED, locked in position, with an arm conductor as a guide, the

B-36 Firing

Lt. Col. Curtis LeMay's Strategic Air Command, referred to "war foot" several months ago, is rapidly moving that status as is shown in the accompanying pictures. At Convair B-36A bombers move from modification hangar at San Diego they are tested to the gun bay on Lindbergh Field's twin test facilities, using live ammunition.

In the 1950, each gun is 0.305 gauge (10 mm) B-36B rounds in bursts of 17 to 22 shots each for a total load of 300 rounds. Prior to the actual firing tests, inspections are checked, and gun barrels honed to be sure they are in proper coordination with the breeches receiver tubes.

At the gun bay, constructed of wooden framework, sturdy backed by two of earth and sand, each weapon is sighted and locked in position for flight. As an added safety measure, gun receiver tubes are held in the breeches receiver tubes.

After the gun is fired, the breeches receiver tubes bring brought out and the flame gun test experts take their place for being. The fuses who control the weapons test are the "guinea," who actually sets the gun to shooting.

Funds for the year are earmarked for testing of European aircraft and other defense planes. But the program hasn't started selling yet. Military leaders estimate it will be 1954 before Europe can mass produce aircraft.

What's Ahead

During Congressional hearing the Defense Department is changing its first, small changes to meet the situation as having.

► Electronics. Maritime Board wants



GUNS ARE FIRED into wooden framework built up by two of earth and sand.

"sabots," who can halt the test impulse by a safety device of not setting fire to the gun tube, and "watchers," a third man outside the plane who gives the word to fire when it is certain that all is clear. The three men sit at a control console to check for defects. If none are located, the gun are reseated on the plane for serial firing tests by USAF at military firing areas.

Ready to have operational use in 1952.

► Air defense. Army is going ahead in developing an Low-altitude radar which will be able to hit planes at speeds of over 60,000 feet.

► Missiles. Location is being worked out by the Office of War Materials. Sixty Lopatka Johnson's Defense Department Committees will open hearings shortly. Procurement will probably be made for government training programs in storage fields, government-financed transportation to short-



WONSAN industrial boomtown-type plants show deep scars after 23d Bomb Group strike.

Evaluation: Bombs Over Korea

Arsenals and rail centers hit by heavy raids in attempts to knock out enemy's war-making power.

The grim picture of how strategic and tactical air systematically smash an enemy's military resources is again being repeated by USAF evaluation teams after on-the-spot checks of bombed targets in North Korea.

Only for years after its first massive bombing sweeps in Germany and Japan, the USAF has struggled through the war-finisher routine of interviewing spectators, taking clamp measures and probing through the rubble to learn what happened.

The evidence plainly shows that U.S. air has not lost its deadly touch. **Planes First Destruction**—An analysis of individual targets by the teams showed how Strategic Air Command's policy of knocking out the enemy's ability to make war at the source paid off.

Korea in Arrest, one of North Korea's major river and mountain passes, hit by more than 380 tons of explosives from B-57s between Sept. 12 and Oct. 3, was so paralized, completely knocked out of action.

Pusanhang Arsenal, where more than 40,000 workers produced shells and field guns, was a total loss after one 98.5 ton raid.

The major center for the Reds' entire Korea rail network, contained within a mile-square area, was gutted by 304 tons dropped between July 21 and Aug. 22. The Communists fled after the first attack, leaving their headquarters.

Newest rail goals, key link in the entire North and South Korea rail system, were demolished by 256 tons of bombs, July 21 and Aug. 6. **Heavy Front-line** bridges and railroad air framework completely flattened the North Korean air closely posted up in this study of bombing

had caused damage and then shipped south for safety. This activity was stopped at the head when PEAf fighters struck the plant, dropping bombs and firing rockets into the equipment and watching out of the tanks.

Less than a week later, B-29s returned to pound the railroads.

A flight of B-57s from Wiesbaden on the morning of Aug. 10, found plane load the railroad tracks, marshalling yards and warehouses another flight went over the Chosin Oil Refinery in the northeast section. A third blasted the locomotive engine shop.

Wonsan had lied it. The damage survey showed that at least 43 locomotives and 60 or more railroad cars of every type were destroyed during the strategic raids.

Speedy Mobility—SAC's scheme of keeping in active status up to date combat planes for immediate deployment on every raid it has shown its value in the recent come-on.

Part of its mobility is attributed to fly-away maintenance kits, carried in the plane's bomb-bay, which enable enough material being carried with each plane to keep it independently supplied at the field during its early combat operational period.

In slightly less than four months overseas, the 2d flew over 3000 tons of bombs and dropped 2000 tons of bombs on the enemy. The group suffered only one operational loss during that time when a plane crashed in the Caspian Sea, killing pilot, co-pilot, observer and sparing three.

USAF Box Score in Korea

(June 26—Sept. 30)

What It Took . . .

	Fighter	Light Bomber	Mid.	Bomber	Recon	Cargo
Total	25,043	2658	3139	4627	6671	
Tons bombs dropped	29,138	Recon sorties fired	21,900,000			
Rockets fired	65,112					
Refuelers dropped	11,551,000	Tons freight airdrop	15,925			
Passenger airdrop	26,635	Recon airdrop	8441			

Results:

Targets bombed—1038.
Destroyed 13 major strategic targets (all available), 172 enemy aircraft, 13,000 Johnsonian strategy targets killed.
Destroyed or damaged 330 locomotives, 374 freight cars, 45 wagons, 22 oil storage tanks, 107 barges and boats, 533 vehicles. Wrecked 13 railroad yards.
Made 376 bridges hit, 33 tunnels ruined, 687 field guns silenced.

What It Cost . . .

USAF planes lost in action: 96 (14 fighters, 8 light bombers, 1 medium, 2 transports, 4 observation).
USAF operational losses: 45 (14 fighters, 12 bombers, 5 transports, 12 mac).
Total personnel casualties: 175 (51 killed, 58 wounded, 65 missing, 3 prisoners).



BOEING KC-97A prototype tanker in flight, showing its unique refueling equipment.



FORMATION fueling of B-57s by KC-97A shows new pattern of hoses on tank plane.



FUEL-LINE BOOMS and operators are located in underwing Matrix wing structure at upper and lower fueling bays.



New Use for Stratofreighter: Aerial Tanker

PRODUCTION

Subcontracting Swells As USAF Expands

Boeing spends more than half its AF funds on outside suppliers.

The federal stimulus already called for by President Truman for U.S. aircraft production this year will do more than just swell the dollar volume per inspection of subcontractors and parts and materials suppliers in the industry. It may also call for the removal of these participants to take more load off the prime contractor in the sharply accelerated production program.

Already, a substantial portion of Air Force funds is dispersed by the contractor for aid in building the end product. And with participants by more units and suppliers, still greater diversion may be expected.

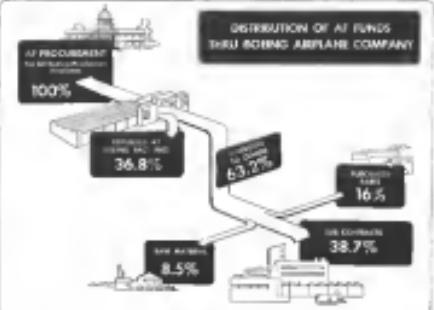
► **Boeing** In Example-1, rates of how widely the contractor's dollar is spread in its industry show in Boeing Airplane Co.'s subcontracting operation, which shows a great deal of aids and supplies at more than five-eighths of all funds it receives from AF aircraft procurement.

On the basis of this situation, with Boeing's estimated \$1 billion building the present for aids and supplies would come to \$525 million.

Of the funds received for aircraft production in both the Wichita and Seattle plants—the B-47 Strategic bomber, F-86 Sabrejet, F-100 Super Sabre, and the C-124 Globemaster transport—Boeing ends with only 36.8 percent to apply to labor and spending costs and other expenses. The remainder (63.2 percent) is paid out to subcontractors (18.7 percent) who build assemblies to Boeing specifications and ship them to the plants for assembly into the planes, to supplies of finished parts (16 percent) such as electric motors, valves, and oil tanks, and to raw material suppliers (5.5 percent) for aluminum, steel, wire and similar items.

► **Many Participations**—But this spread of funds shows what a done with only approximately half the amount allotted for the total cost of the aircraft.

Another broad rub supply participation is also found with temporary aircraft under Government Purchased Property—engines, propellers, radar, armament, shields, flight instruments and other accessories not



HOW B-47 FUNDS are channeled to Boeing's numerous suppliers is shown here.



SHADED SECTIONS are made by well-equipped and experienced contractors, usually purchased by the government and applied to the defense budget for re-investment.

► Some of Subs—Included in the na-



Cessna representatives confer with Boeing supervisor on B-47 sub-assembly project.



REAR/bottom portion of fuselage for Boeing is lowered on flat car for shipment.



TMCQ personnel visit Boeing at Seattle to get Lockheed B-47 production know-how.

- **General Aircraft Corp**
- **Grumman Aircraft Corp**
- **Hill Aircraft Corp**
- **Hoover Aircraft Corp**
- **Cessna Aircraft Co**
- **Chase Vought division of United Aircraft Corp**
- **Cleveland Aerostatic Tool Co**
- **Coltene Co., Inc.**
- **Consolidated Vultee Aircraft Corp**
- **Douglas Aircraft Co., Inc.**
- **Douglas Mfg. Co.**
- **Eastman Kodak and Malches Co.**
- **Europac Aviation Corp**
- **Imperial Metal Mfg. Co.**
- **Hoover Aircraft Corp**
- **Ryan Aeroplane Co.**
- **A. D. Seely Co.**
- **Synderline Aerospace Co.**
- **Texas Locomotive and Mfg. Co., Inc.**
- **United Aircraft Corp**
- **Virdi, Inc.**

► **Bendix**—Subcontracts at Boeing's Wichita division, where it makes the B-47, amount to approximately 40 per cent of the total aircraft cost on this project. In addition, another 20.4 percent goes for outside purchases of parts and materials, bringing outside work to 57.4 percent.

North American's subcontractors amount to 35.6 percent of the total contracts with another 18.8 percent for parts and materials, bringing the total to 54.4 percent.

Reason for the greater volume of subcontracting at Wichita is attributed to defined enterprise limitations there and the need to spread further burden since there is no community's facilities. But the work is being conducted as far as possible to the subcontractor and need seems to be the only problem of administration, finance, representation, inspection and transportation.

Seattle, on the other hand, has subcontracted more power and fueling built up onto the end of the last one or pre-assembly contract for the B-10 and C-97, leaving a smaller volume of subcontracting as necessary.

Cessna Halts 140 Production

Cessna Aircraft is temporarily suspending production of its little efficient 140 two-place on Feb. 15.

Companies officials give shortage of materials as the reason, stating that with the materials now available, they felt that the best way of saving face entanglement would be to cut back their line of models and limit output to the four-place 170 and the five-place 190 series.

The company is becoming increasingly involved in military subcontracting and has recently been awarded additional orders for its all metal L-19 two-place for the Army.

Negotiated Contracts

An award of \$900,001 to Westinghouse Electric Corp. to generate led the list of negotiated contracts released by the Air Force for the week ended Dec. 15. The total awards released for the period were \$1,237,425.

Six companies had one contract awarded each. They were: Clark, a company partnership; C.R. Foss, Inc.; Gossen's Milling & Grinding Machine, Inc.; Gossen's metalworking, Inc.; and Continental Machine Corp., Madison, Mich., against two prior bids. Cf. GIA, page 10.

Electric Storage Battery Co., Cleveland, won storage batteries, Cf. RIL 521,818. Fisher Engineering, Inc., Huntington, Ind., was awarded Cf. 186, \$10,000. Gossen Electric Co., Schenectady, N.Y., was awarded Cf. 186, \$10,000. Gossen National Battery Co., Dayton, Ohio, was awarded Cf. 186, \$10,000. Gossen Mfg. Co., Duluth, Ga., light illumination, Cf. 186, \$10,000. Jack & Jones Precision Industries, Inc., Cleveland, general, Cf. 186, \$10,000. Kline & Fong, Inc., Chicago, telephone and, Cf. 186, \$10,000.

Lundstrand Aircraft Corp., Portland, Calif., has succeeded in bid and subcontract for aircraft, Cf. RIL \$100,000. Martin Rockwell Corp., Indianapolis, Ind., was awarded Cf. 186, \$10,000. Midwest Mills, Inc., Louisville, Calif., was awarded Cf. 186, \$10,000.

Mitsubishi Engineering Corp., Cleveland, Forest, electric, heat treating, Cf. 17A, \$10,000.

Mobile Union Refine Corp., George, N.J., sold tubes, Cf. 186, \$10,000. Republic Aviation Corp., Farmingdale, L.I., N.Y., 221 for design person, Cf. 186, \$10,000.

Ryan, Inc., San Jose, Calif., wire-bracing hardware, Cf. 186, \$10,000. Standard Thermal Corp., Dayton, light fixture by, Cf. 186, \$10,000.

Wrightslawn Electric Corp., Dayton, generators, Cf. 186, \$10,000.

Yankee Engineering Co., Boston, Calif., has succeeded in bid and subcontract for aircraft, Cf. 186, \$10,000.

Yerkes Corp., Toledo, Ohio, 221 for aircraft, Cf. 186, \$10,000.

Zodiac Industries, Inc., Farmington Hills, Mich., was awarded Cf. 186, \$10,000.

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Contract awards for aircraft, which were the total bid awards, show no new requests for further information, detailed by addressed Contracting Officer, AMC Wright-Patterson AFB, Dayton, Ohio, at telephone ME29-9373.

RFI Invitations to Bid

An additional 100 contracts were issued during the week. These included contracts for aircraft, which were the total bid awards, shown no new requests for further information, detailed by addressed Contracting Officer, AMC Wright-Patterson AFB, Dayton, Ohio, at telephone ME29-9373.

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There are a lot of RFI's this week, and Defense Dept. awards of \$100,000 or more in the last few days. Cf. RIL 521,818.

PRODUCTION

Alfa Romeo, Milan, Italy, will manufacture 100 Fiat 124 Spider cars, Cf. 186, \$100,000.

Bell Aerospace, Inc., St. Louis, Mo., 221 for aircraft, Cf. 186, \$100,000.

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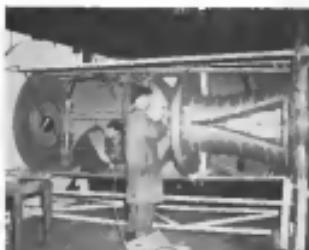
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Attacker Production for the Royal Navy



STRAIGHT WINGS of British jet have been set up in assembly fixtures for final work on landing gear and wing fold. Meanwhile,



ENGINE BAT 1000 rpm resulting in engine failure for assembly fixtures for final work on landing gear and wing fold. Meanwhile,



FUSELAGE. Fairlead body shell is then removed from assembly fixture and placed in similar fixtures of right wing fairing for wing inspection. In adjacent bay



FINAL ASSEMBLY of group of four Attacker is begun. Newest ship has revised engine access to engine bay through removable top fairing that. Finned . . .



ATTACKER (prototype photo) passes about 12,000 h. Rolls-Royce Nene with 1600 h. static thrust gives a 567 mph speed at sea level, nearly 4 hr endurance, nearly 50,000 ft ceiling. William-Austen/Aerojet Supermarine works build it.



AVIONIC equipment displayed on wing panel of X-1 instrumented for NACA assault

a second wing 20 percent thicker. To insure that the wing would be sufficiently supple so we're not hitting you short of it, the NACA therapist as quoted in it was a take from each finger in a stretchingrometer.

We had no success convincing our selves that this could be done, when they quoted the same thing for the test surfaces.

Well, those same guys think when you have to persuade the scientists that there are no fix things which your engineers can't do. So we settled for a slightly lower number.

► **Dick Pendergrast:** Although the exact performance of the airplane is still held secret by the Air Force, it has been flying at supersonic speed for well over two years.

The trials which accompanied the announcement of its first flight, eight months after it was assembled, were tremendous. The sight before us last year, Dr. Charles Yeager, the Air Force's chief test pilot, was trying to explain the proper mood—let's call it somber the day as he introduced his team to the press as he introduced the first and most important speed stage in these flights.

And perhaps one of the most gratifying things to us has been that the airplane has proven itself such a reliable workhorse. It has responded remarkably to every requirement, to every test and every, every man at all stations, from flight test to ground test, in the original configuration, except at one point, the closing doors. No changes have been deemed necessary.

This is still a great deal as remarkable a fact as the consistent performance of the top aircraft. To my knowledge, the X-1 is one of the very, very few, if not the only aircraft to repeat another, to complete its flight test program without a major or minor change—mechanically, structurally, or other wise. This is true of the plane even to this day.

On the first flight, I must say, it was awful, although not quite on the second, the chase plane pilot who has put his foot on the dashboard and roll over the instrument "Lookin' on Land." And on the third he wasindsighting with the chase plane all the way down.

► **Poff Pown:** When the first (all power) flight was made, Yeager freed the rudder—No. 1, then No. 2, finally off free, then he suddenly started to throw

away their books and references in case owing, this plane—it can be appreciated when a real tribute the X-1 is to the engineers responsible.

► **Existence Symbol:** Two of these six planes were built. One has been used by the NACA for research problems. The other of these has been used by the Air Force for performance tests. It has a code name, "Sally," all above the word, of course, but not at those speeds exceeded many of the conventional types of missiles.

On Aug. 19, 1950, General Hoyt S. Vandenberg, Chief of Staff, U. S. Air Force, participated the X-1 to the National Air Museum of the Smithsonian Institution during commission of the Air Force Arm museum in Boston, Mass.

In his presentation remarks, General Vandenberg said that the first supersonic flight of the X-1, on Oct. 14, 1947, was the start of the most significant period of the aircraft, and the beginning of the second. In a few words, the inferior period became history and the superior period was born.

"That event occurred almost 4½ years after the first flight at Yuma, Ariz. But the second epoch-making flight, like the first, was an American achievement. The X-1 was conceived, designed and constructed through the collaboration of the Bell Aircraft Corp., the National Advisory Committee for Aeronautics and the U. S. Air Force. It was a joint effort of numerous agencies of the Air Force. That institution, that our country has sacrificed its leadership seen fit by the general of the Wright brother half a century ago."

There is a favorite story among the X-1 fliers. It's about the Air Force pilot who, flying it for the first time, did so satisfactorily with its performance that he was shooting almost vertically with all his rocket going full throat, at much greater altitude than he should have. Suddenly realization hit him, and he realized, "Oh, my God!"—and a dive came back, "Brrr!"

► **Mac in Wada:** Three additional X-1 airplanes are now under construction at Bell to implement further the research at the NACA and the AF.

It is still too early to evaluate the influence which the X-1 has had on aircraft development. It seems to us, though, that it has created a new class of aircraft—the X-class of which we see the X-1 at Bell Aircraft, and of which there are several others under construction by other manufacturers.

The cockpit of the X-1 has had no rocket propulsive structural design and construction is such that it might be invited up by setting the plane that it proves the feasibility of ramjet flight.



GRID SCREEN frame plane in various positions to permit analysis of performance visibility for test flight, leading conditions

Camera Frames Low-Level Flight Data

Douglas Aircraft Co. uses a new camera-developed camera to record data on airplane takeoffs and landings from which true speed, altitude and acceleration at low levels can be computed.

Knowledge of aircraft performance during takeoff and landing under various conditions is extremely valuable to designers and operators of aircraft and military plane sites.

Airplane data project, the site looks on airplane can range length of runway required, altitude left propeller pitch and flap angle under various conditions and the power output needed under different combinations of the variables.

Arthur F. Noyhart, photographic manager for the Douglas testing division, designed a portable "Photocenter" which is a photographic instant at three different angles.

► **Double Image:** The resulting silhouette image of a section of the grid pattern is superimposed upon the airplane image on the film. A normal, double-lens shutter, making one exposure per revolution, produces almost uniform exposure across each picture.

The flight path entered must be carefully checked so that it is visible to the pilot who has the aircraft from a distance of 10 feet that becomes the base of a

triangle and in computing the frame by base position of the test airplane.

The Photocenter is placed on a base perpendicular to the light path at a constant distance varying from 1000 to 3000 ft., depending upon the length of the run to be tested.

Airplane leveling is accomplished by means of a spirit-level tripod. The grid strands for 50 deg. are each 10 in. apart, and the cameras are 10 in. apart.

► **Space-Time Stays:** Similar data are taken on the 10-camera instant film to cover an earth-movement in linear and vertical airplane travel. Between glass plates spread over time present a graphic study of performance during any type of low-level run.

Lots accuracy and some cumbersome equipment has been used by Douglas for some time. Lockheed (Aviation Week, May 3, 1955) and other major manufacturers are taking the general principle to reveal low-altitude performance.

Analytical Approach Outlined by Zwicky

Thinking on a cosmic scale was outlined and encouraged by Dr. Frits Zwicky of the California Institute of Technology in his speech at the last night dinner of the American Rocket Society on Nov. 30.

Dr. Zwicky, who is among other things Prof. of Astrophysics at Cal Tech, spoke on "Tasks We Face." He outlined his social thinking method, called cosmological analysis, and applied it to problems of jet propulsion.

► **How Many Jets?** As an example, he stated that one might like to know how many different types of jet propulsion engines exist. After defining the problem and summarizing his parameters, Dr. Zwicky stated very cleverly in his cosmological analysis gave a result of 11,230 different possible types of jet engines.

Earlier in the evening, Dr. Zwicky was made a Fellow of the Rocket Society. Following membership was also presented to Dr. M. J. Zemke, Dr. G. Edward Pendray, Louis Dure and Dr. Robert Adelstein Calvus M. Tolster.

Self-Aligning Bearing

Technicon at A. V. Roe Canada Ltd. has developed a new thrust bearing which automatically adjust itself to weight requirements.

The unit, which will be used in the company's production of aircraft, the Condor, is constructed to float in a plastic ring.

Any slight misalignment of the shaft is accommodated by a deformation of the plastic ring, while the "monocoque" of the central sleeve to maintain the required resistance to float loading.

AVIONICS



DIRECTION FINDER LOOP antenna for submarine detection in airplane configuration.

Problems of Submerged Antennas

Radiation and efficiency of conventional external types must be maintained in drag-free suppressed antennas.

(McGraw-Hill World News)

London.—The external antennas of modern aircraft is served generally by only one set of equipment—antennas. They provide from the fuselage, they stand alone in the fuselage, they fall down and sit. And they cause drag. Now, this is unavoidable, but it is durable. And when it comes to improving the overall performance of an aircraft, every little bit helps. The only distinction left to improve on some of the current planes is the antenna system.

But for all their drag, antennas work best when they are long enough. The problem is to hide them under the airplane without some way and still retain their efficiency.

Suppressed antennas—and suppressed is the current terminology for saying that an aerial has been built within the plane's contours—will add something to the weight of the aircraft, but the overall performance gain enough to warrant the considerable research and development required.

A secondary consideration, although of importance, is that as speed is raised, it becomes more difficult to reach any external antenna freely.

For the Comet—the problem has been one of considerable importance to the development of the de Havilland Comet, the world's first jet-powered liner, as well as in that of the Avro Arrow, one of the cleanest-faced

seals for communications below 20 m.

Since the fuselage is already sealed, it would be necessary to consider that large part of it which would be used as an aerial, but such large scale analysis would undoubtedly compromise the mechanical and structural performance of the aircraft.

It would be possible to carry the whole aircraft structure as an aerial and use a small coil secondary to provide reduced drag. If the diameter and length are modified from each other and maintained in constant phase of relation, thus creating a system which conforms, more or less, to a crossed dipole and which produces an approximate omnidirectional pattern.

The success of this method depends on having a wing span of not less than 0.2 times the length of the required frequency range.

Tests with this system have shown that communications can be provided over distances equal to those obtained with a fixed wire aerial and that the radiation pattern is almost circular. □

► VEF Aeroflex, the high frequencies, the smaller series required do not present such serious problems and have been ingeniously designed as such a way that they offer no extra surface to create drag on the aircraft. It is a most poor solution which uses suppressed aerials and is to this being developed a spherical aerial which will be able to reduce the drag factor. For that method, parts of the aircraft (fan ducts, tail fins, etc.) can be repositioned to avoid aerials or be made of radiated material with the aerial class in the interior.

For example, a grid aerial for VHF communication based on this measure gives a performance comparable to an external aerial of the whip type.

The best example of a buried aerial is the rotating loop for medium frequency direction finding. The Marconi type AD/ATM/1 and AD/ATV/2 direction-finder equipment have long loops on long, slender booms which provide radiation, passing from a shallow loop mounted in a tray below the aircraft's skin.

Instead of the normal aerial covering passing over the loop, radiating material is used to cover the aperture. A symmetrical arrangement of rods inside the aperture gives a vertical signal for use determination.

Mechanical tests at control at every point of an aerial's radius and any insulating material incorporated in the structure must possess excellent insulation as well as electrical properties

A insulation of woven glass cloth bonded with dielectric resin has proved to be the best material.

► Gentry Research—Another radiation system, called cavity aerials, is used for suppressing aircraft aerials.

It consists of a rectangular slot in a metal plate and lined over an insulated cavity located in a solid substrate. A further method of energizing is by transmission line directly connected to opposite ends of the slot. If the slot is a half-wave length long of the operating frequency, it will behave the same as a half-wave dipole. If this width is result in comparison to a given wave-length, radiation is polarized perpendicular to the length of the slot.

It would not be possible to measure such data as an aerial as this would probably create more drag than an external type aerial, as the slot is itself narrow with the waveguide type of detector.

One of the properties of this type of aerial is that it solves on both sides of the slot so that some method (such as placing a resonant cavity) is used to adapt to elements situated in the aircraft. This type of aerial system leads itself to many applications. For instance, as explained before, the housing on a boom can be mounted supporting a pair of this type of aerials on each side of the aircraft. □

► Marconi. The mechanical and structural properties of the aircraft are not the only factors which must be carefully studied and tested to decide designing and installing suppressed aerial systems.

The physical shape of the aircraft—with its publications at various points of large bodies of metal inserted from the aerial portions and the shape of the distinctive features which assist柔度 to the conduct of the aircraft, all have an effect on aerial performance, so it is inevitable that suppression must be planned on the flying boats, which are subject to constant damage. These factors also make it necessary for each type of aircraft to be tested separately for a suppressed aerial designed for one type of aircraft can rarely be used for the other type of aircraft.

These matters have been under consideration in the Marconi research establishment for some time now, when in November 1946, the company were invited to join the discussions of the Comet as it is intended to evoke a series of research results for the aircraft which would conform to certain given characteristics regarding proportions and loading.

A test was immediately drawn up of all the methods which could be used and was drastically reduced after one selection with the aircraft designer.

A Lancaster freight was brought in

the Marconi laboratory and work at Wimborne, and practical experiments were made with the full-scale fuselage, as well as with scale model aerials.

The first test of possibility was to measure these were three methods for HF, MF and VHF. The first two methods for VHF and MF were each for Reference navigation and ADP. All these methods were explored until the last in each group was found. It was then that de Havilland aircraft structural engineers and Marconi wireless engineers worked out final plans, the planform negative continuing gravity to the new source of suppressed aerials.

For the final development stage a full-sized Comet aircraft was used and ground tests were made at the de Havilland works in the Fleet area.

The first Comet had no suppressed aerial, but was mainly an airframe testbed. On later flights overseas, however, a long-range HF communications apparatus aerial was fitted together with suppressed loops for the ADP. The second Comet was wholly a suppressed aerial aircraft.

The full Comet installation is typical of a suppressed system. The main fin, which is mounted from the tail fin, is used as an HF aerial. Directive type loops on the fin and tail plane connect the tail and mouth for VHF, COB and ULS landing.

For MF, a grid aerial is mounted in the down which rises the nosewheel and are themselves behind dielectric flaps placed. Loop aerials for ADP are mounted in the top of the fuselage and covered with dielectric flesh panels. The grid pair serial of the ILF equipment is mounted behind the shield covers in the cockpit while the remain the ULS aerials COB and radio altimeter aerials are mounted behind dielectric panels in the underside of the rear nose fairing.

High Tower for Avionics Research

A 1200 ft. high tower for the Air Force's missile development programs has been recently dedicated at Forest Park, near Utica, N.Y.

The structure, approximately the height of the Empire State Building, was built primarily for development and testing of LRTRAN—Long Range Air Navigation system for the Convair C-1A Research Griffon ATF aircraft of the Defense Research and Development Commission.

Construction is still set in a criss-cross base and sustained with guy wires.

Tower was built by John Beeler Construction Co., Madison, Ohio, and Wadsworth Engineering Co., Cleveland, N.J.



Iron-Constantan
Copper-Constantan
Chromel-Alumel

FOR MEASURING TEMPERATURES IN AIRCRAFT



ANEM-1 12 MM. compensation
straight-wire measuring type thermocouple
used for measuring temperatures above 500° F.
ANEM-2 12 MM. compensation
straight-wire measuring type thermocouple
used for measuring temperatures above 500° F.
ANEM-3 12 MM. compensation
straight-wire measuring type thermocouple
used for measuring temperatures above 500° F.

ANEM-4 12 MM. compensation
straight-wire measuring type thermocouple
used for measuring temperatures above 500° F.
ANEM-5 12 MM. compensation
straight-wire measuring type thermocouple
used for measuring temperatures above 500° F.

ANEM-6 12 MM. compensation
straight-wire measuring type thermocouple
used for measuring temperatures above 500° F.

ANEM-7 12 MM. compensation
straight-wire measuring type thermocouple
used for measuring temperatures above 500° F.

THE LEWIS
ENGINEERING CO.
Manufacturers of Complete Resistive
Measuring Systems for Aircraft
WIREWHEELS, CONNECTORS

EQUIPMENT

Pneumatics Powers New Plane Systems

Kidde develops new 4 cfm. compressor; 3000 psi. controls.

By George L. Christian

BELLEVILLE, N. J.—When will the first practical U.S. oil pneumatic aircraft be built? A number of days closer to flying by 1975, says Walter Kidde & Co., Inc., producer and commercial operator who will not be long to follow.

Pneumatics is being rediscovered as a means of actuating aircraft structure, systems, they say.

Used many years ago on aircraft to operate such systems as landing gear actuation, pneumatics in more recent years took a back seat in favor of hydraulics and electric systems.

Evidence of the growing interest in air as a means of transmitting power to aircraft structures can be seen in all-pneumatic aircraft like the Fairchild Dovey, and the fact that at least one new American jet fighter plane has been modified up with an all-pneumatic system, according to J. T. Russell, manager of Kidde's Aviation division.

Engineers at the Belleville, N. J., company say that, although pneumatic systems have been and are limited in aircraft applications for several years, they have not been expanded to take over all the chores they are readily capable of performing. Reason for this study dependence at most of the country is lack of total pneumatic experience and know-how, observers say.

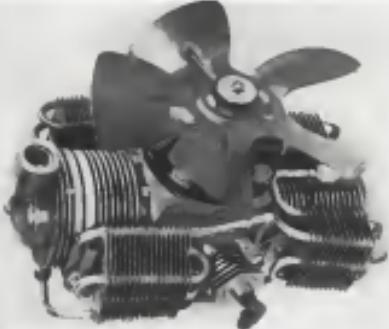
But that is rapidly being remedied. As much as U.S. manufacturers are devoting considerable time, effort and research to developing the equipment and technical knowledge required to make an all-pneumatic airplane a practical reality.

Firms like The Corrington Co., Minooka, Wisconsin; Air Brake Co., Milwaukee, and Kidde.

Paul L. Ladd, Sales Manager, told Aviation Week that the prime advantages of pneumatic systems over other means of actuation are:

- Speed of operation. As long as a pressure differential of 2 to 1 or greater exists between the air source bottle and the actuator, the speed of air in the line approaches that of sound. As an example, gun charges operate at 17,000 psi, for example.

- Insensitivity to low temperatures. Pneumatic systems can operate in well at



HIGH-CAPACITY 4-cylinder, 4-stage, air compressor recently developed by Kidde. Fan-cooled exhausts keep air temperature down. Internal mechanism is patented.

-100 deg. F. as they do at room temperature, an important feature on high-flying jet aircraft.

• Lightness. Although certain metal components such as the compressor may be heavier than their counterparts in older systems, the entire system is from 18 to 20 percent lighter than comparable numbers of present-day hydraulic systems. This is due to lighter-weight basic, aluminum, or stainless steel, also to use of titanium instead of steel in open systems and simplification of certain components.

• Uniflow supply air. If minor leak occurs, the system can continue to operate because air is continuously replaceable.

• Air is safe. It can neither burn nor short circuit.

Another criticism of the durability and diversity of pneumatic applications, according to Albert Schaeffer, Kidde's manager of aircraft engineering, is that at every American airport there are 100 aircraft which have been so modified over the years that the system has literally "run out of air." Light compressor were needed, but none was available.

An additional disadvantage to an air system is the difficulty encountered in detecting faults.

Features of the compressor are

AVIATION WEEK, January 1, 1961



QUICKDISCONNECT and check valve.



STORAGE BOTTLE, non-wire tensile.



AIR CHECK VALVE, one of Kidde's non-

wire tensile storage cylinders to permit high capacity output at altitude. Extent air taken in at low altitude is released through an integral relief valve.

• Hydraulic actuators are built three stages, to keep an actuator in positive position.

• Compressor. Specification: Continuous operating pressure, 15 psi; weight, 13 lb.; width, 7 in. with a 14 in. projection; depth, 44 in.; capacity at sea level, 8 cfm at free air at 3000 psi; capacity at 15,000 ft., 1 cfm of air during decompression守空.

Other pneumatic components developed by Kidde for 1950 or 1950 psi systems include fused, quick disconnect fittings, check, relief and safety valves, pressure switches and vacuum gauges.

Maintain apparatus consists of an automatic maintenance unit with a chamber and seat which quickly removes parts and threads all 99 percent of the outer housing of the refueling nozzle prior to the air. It automatically releases the outer when the compressor stops and an optional electrical heating element prevents freezing.

The method used is reliable and possible of drying air to a dew point of -40 deg. F. If a dew point of -45 deg. F. is desired, the optional, solid gel separator is recommended.

• Design Coupling—J. D. Hull, Jr., manager, Avionics, Avionics division, indicated that Kidde had completed the design of 3000 psi aircraft pneumatic system components. A sufficient amount of air to perform multiple operations of all actuators being pneumatically operated is stored in rubber bottles at a pressure of 3000 psi.



PREMIUM 5911-CHI sheet electrical insulation



MULTI-PORTED port as a valve.

TORRINGTON NEEDLE BEARINGS

stand up in rugged service



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NEW AVIATION PRODUCTS



Shock Mount

A recent addition to the large family of vibration control equipment produced by Lord Mfg. Co., is the "Tempo-proof" mounting for airborne electronic equipment.

This shock mount allows its mass base to vibrate to function efficiently through a temperature range of -60 to 150 F. It is designed for use in aircraft aircraft and missile applications. Specification ANE-C-172A. According to Lord, mounting in this area meets the requirements of Specification ANE-14, which requires that such parts withstand a 30G drop test.

Patent dispensers at these rates prevent excessive equipment motion at resonant frequencies. Mounting drift has been reduced to a negligible amount, Lord says, eliminating the tendency of equipment to sag or drop after long periods of use.

Since they function efficiently over a wide range of locations, these mounts reportedly make it practical for manufacturers to standardize on them for several types of equipment.

While they are designed primarily for use in aircraft, Lord believes they also will find use in industry, especially in applications where temperatures are above or below the range in which roller bearings ordinarily are used.



Wing Flap Actuator

"One of the latest and newest of flight control systems" now is using a wing flap actuating system made by Heaves Electric Co., the firm reports.

The Heaves installation includes a right and left-hand actuator with a servovalve assembly. The servovalve can drive both leading edges through its operating range under maximum load, even if one of the two actuators is in operation. The actuator arrangement enables each actuator to operate the complete flap system independently in an emergency.

Heaves says the new actuator has successfully completed all laboratory and flight tests. Address 2108 Sherman Ave., Los Angeles, Calif.



Field-Tests Radar

A manometer outflow gauge weighing only 17 lb., yet reportedly incorporating features found in heavier laboratory equipment, is being evaluated by the Hycon Mfg. Co.

Quantity orders for this model have been placed by the Air Force and Navy, the maker says. The portable unit, built so extreme weight handling is designed for checking radar components in the field. With an removable top lid and in place, the device weighs 17 lb.

Nearby radar test stations located in an altitude of 10,000 ft. are used in its evaluation at this rate, according to its developer.

- Wide band and intensity features
- High sensitivity
- Incorporation of dual coupled amplifiers

• Field reproducibility of wave forms with 3 continuous rate filters and 10dB square waves.

High performance of the device is the result of "conervative design, to make with the use of high-gain, matched tubes without dependence on tuned circuits or peaking rods," Hycon says.

The circuit contains nine tubes, including vacuum. Sweep frequency range of the set is 3 to 1000 cps. 90,000 rpm.

ALSO ON THE MARKET

Schreiter valve for fire-fighting apparatus has four porturi making it possible to introduce into water streams one or two percent of wetting agent or fire retardant concentration of foam concentrate. Made by Pyrene Mfg. Co., 368 Belmont Ave., Newark 5, N.J.

Diesel utility grinder for tool rooms and machine shops has fast-ground, long-lasting, fine abrasive wheel, quick-starting, 1-hp motor. Features dynamically balanced rotor, integrally cast wheel guards and adjustable feed system. Made by Lima Electric Motor Co., Lima, Ohio.

Market Action Listed Airline Common Stocks

	1945-46	Dec. 15, 1949	Dec. 15, 1950	% Chg. 1945-49
	High	Close	Close	
American	25	82	138	11
Breitling	17	11	114	41
Capital	49	81	124	44
C&K VTC	35	7	96	36
Colonial	45	91	81	-11
Eastern	14	141	175	21
National	41	79	134	69
Northwest	21	28	36	32
Pan American	65	114	128	6
TWA	29	98	139	14
United	79	17	210	23
Worldwide	62	118	238	29
Worrell	40	—	114	40

Note: All figures eliminated from 1945-46 year.

average longer than 18 hours during 1949 and 1950 compared with an average of only 6.5 hours flown daily during 1941. With depression and other fuel economies continuing regardless of whether planes flew or not, the importance of this higher utilization is quite evident. Even in introductory 1949, daily aircraft utilization averaged but 6.47 hours, far short of the wartime experience. Traffic during the war years was concentrated at capacity levels, averaging passenger load factors consistently in the 70's. With a general postwar relaxation of the rules, and more portable tanks, the wartime capacities served to a great extent. It is also noteworthy that reduced roundtripping and promotional rates were eliminated.

► **Primer.** In Reporting—During the present rehabilitation process, striking similarities to the World War II pattern are beginning to develop—but that is no surprise, since with more than 400 four-engine planes together with some 350 twin-engine craft.

Estimates for the months reported and projected for 1950 have also been

respectively good and have helped spark confidence for an earlier report.

The fact of excess profits taxation on airline earnings is becoming less acute following the Senate proposal of an overall ceiling of 50 percent on taxes.

As a result, airline shares have

recently been paying out new high dividends and establishing their best point in about three years. The accompanying table shows the successive accomplishments in 1949-50, and the 1950 forecast.

As indicated, despite continued transportation and limited passenger, the commercial airlines maintained regular operations over their domestic routes.

As long as to the military effort was

provided by spending high priority

investment of men, material and cash

to accelerate industrial production.

The real impact on wartime surface operations came from making these otherwise normal moves more compact due to military exigencies. Despite sporadic losses of aircraft, the airlines were flying some 75 percent of their former strength. With the tremendous support by equipment theorists, the industry was able to show increases in every mission department during the four-year war period.

A combination of circumstances was brought into play contributing to this rising airman need.

► **Conclusion.** In the conclusion over the effect of the Korean crisis and extrapolated in December, great significance is given to strategic position of the airlines in our changing economy as it approaches a war footing.

Gladly recalled are the courageous stories which typified the air transport industry to show the best courage

in its history during World War II. This group passed over almost half of its aircraft fleet, largely DC-3's, in the armed forces, reducing its loss in the process. Further, a wide variety of contract operations were performed for the government.

In addition, despite continued trans-

portation and limited passenger,

the commercial airlines maintained regular

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► **Conclusion.** In the conclusion

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and extrapolated in December, great

significance is given to strategic position

of the airlines in our changing economy as it approaches a war footing.

This made possible daily utilization

Carriers Entering Familiar Phase

Near-mobilization tempo foreshadows high-capacity, compact carrier operations attained in World War II.

Airlines share has responded as follows in the marketplace. In recent weeks there has been a growing realization that the air transport industry, heavily situated in a price economy, might even be better off under mobilization than under peacetime. The reason should again suffice to explain share prices for the presently depressed levels which followed the sharp decline from the postwar peak established in 1945 and 1946.

For the most part, the low point for airline equities was established around the 1948-49 peak. As earnings prospects began to appear brighter and industry finance strengthened, there developed a limited tendency to reduce safety prices during 1949-50. But the improvement in airline ratios was not very great. This was disappointing to those who anticipated quick profits to their airline holdings.

Nevertheless, 1949 represented a year of solid achievement for the air transport industry and set the foundation for the marked improvement which spilled over into 1950. These gains, the overall manifestations of the strong growth trend of the industry, were slowly establishing investment confidence.

► **Crash Basis.** In the conclusion over the effect of the Korean crisis and extrapolated in December, great significance is given to strategic position of the airlines in our changing economy as it approaches a war footing.

Gladly recalled are the courageous

stories which typified the air transport industry to show the best courage

in fighting bitter cold weather during 1949 and 1950 compared with an average of only 6.5 hours flown daily during 1941. With depression and other fuel economies continuing regardless of whether planes flew or not, the importance of this higher utilization is quite evident. Even in introductory 1949, daily aircraft utilization averaged but 6.47 hours, far short of the wartime experience. Traffic during the war years was concentrated at capacity levels, averaging passenger load factors consistently in the 70's. With a general postwar relaxation of the rules, and more portable tanks, the wartime capacities served to a great extent. It is also noteworthy that reduced roundtripping and promotional rates were eliminated.

► **Primer.** In Reporting—During the present rehabilitation process, striking similarities to the World War II pattern are beginning to develop—but that is no surprise, since with more than 400 four-engine planes together with some 350 twin-engine craft.



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Gulfplus Aviation Oil—Series D—won't keep your feet looking like a mule's hoofs if you've ever put up a cold dinner!



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Our flyboy will tell you that all that meat and mackerel floating around is the most protein source ever non-smoking maintenance problem!

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Compañía Mexicana de Aviación, a Pan American affiliate, claims to have carried 47,691 passengers during the past year, although this compares with 23,010 statistics which are lower. In any case, Pan was the bulk of the Mexican domestic business and probably a substantial part was international traffic taking advantage of the low domestic rates to fly in the border.

LAMSA, the United Air Lines subsidiary in Mexico, carried 15,272 passengers during the year, none of which were also border residents.

■ **Costa Rica:** Another interesting income story of the Mexican airlines is Aerocaribe de Mexico, also affiliated with Pan American. This has done most of its business on an exclusive route it has between Mexico City and the popular Pacific resort of Acapulco—and here, very by air.

This fine, routine flights every hour in the morning, carried 120,000 passengers during the past year to make it second among all Mexican domestic lines.

The airline has been in good flight since it was started in 1954 in two DC-3s which have since been joined on the one-hour trip with considerable success. That year it expects to add another all-time record in view of its new equipment.

Swissair Looks to Government Aid

(McGraw-Hill World News)

Zurich—As part of Swissair's program to stabilize its financial difficulties, the government has agreed to provide \$10 million to reduce the company's debt at the current price of 26 million Swiss francs (14 million francs in 1958). This reduction of 6 million francs reflects the actual losses incurred during 1958 and expected to be sustained in 1959. The airline plans the way for additional government assistance.

The government will pay for the two DC-3s on order by Swissair and scheduled for delivery early next year. The cost of these two planes with equipment comes to 15 million francs (6.15 Swiss francs equal \$1). Swissair will bear charges on these planes only if its profit permit, but at the end of ten years is obligated to negotiate the payment for the purchase price. The DC-3s will be used in the Swiss Atlantic service, replacing the DC-3s now being flown in that operation by Swissair.

In addition, the government has agreed to give Swissair an outright grant of 900,000 francs annually as a subsidy and to be concerned to renourish the company for pilot and other technical training of personnel employed by Swissair but believed essential to the military defense of the country.

At a forthcoming session of the Swiss parliament, the government is expected to propose further assistance in the form by financing a special equipment substitution fund. The company recognizes that in a few years it will be faced with the obligation to renovate all of its aging equipment such as Douglas transports, etc. It now operates 14 Douglas, 4 DC-3s, 2 DC-4s and 4 Convairs. The government contribution to this type of equipment substitution fund is expected to range from at least \$1 million to a top of about \$5 million francs annually.

ACTA Members Post Fatality-Free Year

Nearly all coach carrier members of the Air Coach Transport Assn. have not had a passenger fatality for 12 months. ACTA members might repudiate membership, following the organization of the group after the chaos and flood of new operators after World War II.

During the first six months of 1959, nonclassified carriers transported 181,149 passengers a total of 390,167,294 passenger miles, according to Civil Aviation statistics.

While plane accidents the past year have increased in equipment owned by certain members of ACTA, the planes were loaned to other operators at time of租借, and use that are chargeable to ACTA member owners.

The rounded coach association points its members, holding them as entitled to certain standards of safety practice and operation safety, as well as financial and rate codes.

Super Connie Backlog Grows

Trees World Airlines has ordered 10 Lockheed Super Constellations for delivery in Spring, 1962. The plane is designated L-1049, with 2800-hp Wright CA-1820 engines.

Other orders for the L-1049 now on backlog are: Pan American, Air India, KLM Royal Dutch Airlines, Pan American, Air France, 16 plus several special versions for electronics work. (The military and KLM SuperConstellations have the more powerful Wright can power engines).

TWA's Connies will seat 75 passengers and have a luxury lounge section including suites. Gross weight is 126,000 lbs.

TWA's Connies will seat 75 passengers and have a luxury lounge section including suites. Gross weight is 126,000 lbs.

AVIATION WEEK January 1, 1960

AEROTEC

1920 (B.C.)



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Flow to Airframe, 18000+ aircraft
at flow rates from 1 ft. to 5000 cu. ft.



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SHORTLINES

► Air Express—November's 110,575 air express shipments in and out of New York hit a new high, 7 percent over year ago. Gross revenue of half a million dollars was up 35 percent.

► All American Airways—Federer proposes a fare reduction from \$4.25 to \$3.85 for Baltimore-Washington segment, from \$5.50 to \$4.95 Boston-Washington. This means a drop in connecting flight fares. Federer says dividends would pay \$15.41 for travel to New York, compared with former \$22.79.

► Air Transport Assn.—New assistant vice at ATA is that of Les Barnes as director of operations to the operations and engineering department under new president Miller W. Arnold. Barnes was formerly assistant director of ATA as navigation and traffic control division.

► American Airlines—Big Post Trekker (line heat out-Colombia) for nonstop service to New York/Peekskill. Nonstop competitive routes from Trans-Canada already established on the route.

► Braniff International—Always-like reduced basic DC-9s to cost about \$3 million. Seating capacity is 57 passengers per plane. Company has declared a 25 cent dividend on common stock, first since 1946. Company reports to earn net profit this year of over \$1 million—spurring domestic profit of over \$2 million, international loss of \$347,390, and income taxes of \$846,000 for the year.

► Civil Aeronautics Board—Agency has asked a group of leading aviation attorneys to re-examine, among other things, a code of ethics for administration and rule preparation generally. "One person of this board" responsible have left CAB pursuant to its search to hasten case proceedings, as Interim Executive Director tactics using the due-process machinery. So CAB has turned the task at the lawyers, asking them to settle the problem. Supervising committee on Personnel and Practices

► Colonial Airlines—Company has gained weight in recent years \$16 to \$60 a month to 350 offices and stations employees.

► Lake Central Airlines—Federer has CAB show cause order for mail pay rates as and after Jan. 1 of 25 cents a mile for single-engine planes, 50 cents

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for DC-3s as base mileage of \$762 miles.

► KLM Royal Dutch Airlines—Line offers 2 week excursion fares, Europe—New York, reducing return trip ticket cost by up to 90 percent from Jan. 1—Mar. 15.

► Mid-Continent Airlines—Company has temporary mail rate valid for CAB at 25 cents a mile Sept. 26, 1959 to Mar. 12, 1960. 35 cents Apr. 1-June 30, 1961, 50 cents and up after July 1, 1961.

► National Airlines—National has started the fast direct air route service between Washington and Tampa, Fla. Rate is \$16.80, compared with \$51.55 regular fare.

► Piedmont Aviation—Federer has shown some indecision over CAB proposing bi-yearly renewal of temporary certificate Board panel of company's independent representatives. CAB proposes, among other changes, that the designation of panel be changed from "Piedmont, W. Va." to Lexington, Ky., as System 1, thereby giving one-line service to Louisville and Lexington from Birming and private road.

Piedmont Aviation now bears the lowest fuel retroactive mail pay rate yet established for any of the local service carriers—46.75 cents per revenue mile.

► Pan Am Lines—Federer paid a 30 cent dividend on common stock Dec. 28, 1958, and payout is \$27,000 of the \$80,000 share capital available. First P.O. flight cleared was 25 cents paid Dec. 31, 1947, second was 25 cents paid June 14, 1952. Company earned \$3.12 a share, or \$100,493. The last 10 months of 1959.

► Trans World Airlines—Company is offering two European tours in conjunction with London Travel Service—in combination sightseeing and visits to countries for friends and families of fliers selected. While such members of the tour will have the right to visit at no extra cost to himself one country of his choice.

► Western Air Lines—Line claims the fastest growth in the domestic airline field. Revenue passenger traffic for the first quarter of 1959 were 49 percent over 1949.

► Wiggin Airways—Federer wants to buy the Cleveland-Detroit and the Detroit-Baltimore routes, but Wiggin doesn't buy. Dovin adds CAB allows same mail pay. He believed his additional revenue paying passage items, with only a relatively small down payment.

SEARCHLIGHT SECTION

(Formerly Advertising)

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The University of Michigan is an equal opportunity employer and will have a number of consultant opportunities open to interested individuals who possess an interest in **ENGINEERING, PHYSICS, MATHEMATICS, MECHANICAL, ELECTRICAL, PHYSICAL CHEMISTRY AND IN THE FIELD OF**

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Personnel Office
University of Michigan
Ann Arbor, Michigan

EDITORIAL

THE AIRCRAFT INDUSTRY is taking a beating whether it has planes. The public reads about our current state of grave emergency. Yet everyone who lives in the community knows first hand or hears second-hand that plant capacity is not even being approached. One-shelf operations are the rule and production rates are unchanged. Plant workers are not being hired at substantial salaries. "What's the matter with the aircraft industry? Aren't they profits?" the townsfolk ask.

The answer, of course, is that aircraft companies, like any other business enterprises, must receive orders in order to keep running. The leader of new orders the industry has received since the President's emergency proclamation is trivial. They will be coming, but they haven't arrived.

Until that day, aircraft companies are powerless to do much more than have engineers and hold pathway conferences. They can't go on over shifts. They can't make detailed plant arrangements until they know what type they will be asked to build, or how many.

But the Air Force must do their part to know stuff. The public may hardly believe it, but the reason why the Air Force still hasn't known exactly what kind of war it was going to fight, so how could it allocate all of the funds it already has available? The Army and Navy were indecisive too. First there was the agreement among Presidents Truman, the State Department, the Department of Defense and the Joint Chiefs of Staff on a "new" winter timetable and strategic plan. It has to be put together by our highest policy makers. A few weeks ago it didn't exist. The old timetable and pre-Korea plan of the war of the future had to be scrapped. Of course, the new concept isn't finalized yet; it will be implemented constantly. But the new aircraft orders—and orders for all other weapons—will begin moving out to industry soon.

Up to now, we've written, and the aircraft industry got the signal from Washington, go on with alternative but long operating at the pace it was last bottlenecked by the Air Force in existence. This is the message we would like to tell a wondering, puzzled public.

THE IDEA OF A PANAMACA for quick production of aircraft and engines by the auto industry should be spelled right now by both the nation and auto industry. The public should not be lulled into a false sense of security by the Ford, Kaiser-Frazer, Studebaker, and General Motors entry into the aviation maintenance picture.

Curtiss Aircraft's President Jim Flora has put it best. Flora says this: "A five-fold increase in aircraft engine production within a year simply is not in the cards. Given as delay in manpower gives access to all the necessary work rules and gives all the machine tools we will need, the very best we can do in a year is a three-fold increase in powerplants."

If we can stick a strong fold program through two years from now, in the third year, thus we have brought in the automotive manufacturers as lessors, and established aircraft plants and trained our working force, then we can produce whatever the economy can stand. But there is no such task that can be substituted for time. We think we have a little head start, now that we have already invested Ford to produce the badly needed Waso Major. But no matter how prolific Ford works, it will be the summer of 1952 before the Ford people can get an assembly resolution. Meanwhile established manufacturers will have to carry the load."

Other auto companies too are stoked for war work. Thus

the Administration is setting the stage for inevitable cuts in our export, but it has done little to take the aircraft industry into its confidence. When accused of this, top Air Force officials merely point out that the industry itself will be given all the orders it can handle. More, let us say firmly that the Air Force and the nation have everything to gain and nothing to lose by working with the established industry. Monolithic, over-might, because of any last year production losses by the motor car people

THAT OLD BOGIEY CENSORSHIP seems rather needless, it appears, in the vicinity of Lost Gap George Stratemeyer. For the war at most important Hong, his victory in Korea, we hope the Fifth Air Force Commander has let his finger drop over the New York Times F-86 story. The general the other day referred a "full investigation" of the "presumptive" publication of the news that a group of North American Sabres had engaged for the first time with Communist jets. According to the New York Herald Tribune's correspondent in Korea, Stratemeyer's office off the "final" resolution of the F-86's first battle "was of the greatest satisfaction of the war."

Readers of the page noted as sacrifice at Dec. 16 that the Pentagon's War Room still held to the policy that silence on any type of action in a theater is classified until they are in combat and their presence is then apparent to the enemy. This was the traditional way policy at World War II, and it makes sense.

What security is broken by telling the home folks what the Commissars actually know? The Sabres went into combat with a couple of MiGs. Only one Red plane was shot down, all the others were home in tell about it. From this date Stratemeyer's position seems suspiciously unguarded. Apparently the New York Times thought it was time that should be recommended by their Washington reporters if the press and the public are not to be bombarded into unnecessary censorship.

TRANSPORTATION ASSOCIATION OF AMERICA presents its show in AVIATION Week's Washington Roundup, Dec. 11. The Association, described there as dominated by the military, has shown down the 11 days it costs only to fight government control of "securitization" of all transportation equipment. We are not in the same category of transportation, too. But we think the TAA should start moving in this direction and terminating openly what it means security—the interests of the military first and foremost.

Although a desire serving special railroad interests, its Joint Board of Directors has identified 30 duration as railroad or railcar equipment officials, one that would be identified with ship owners, three with bidders, one with aviation (Standard Timetables of United Air Lines), and one with bus owners.

Another big-off in the TAA's official budget-line of income is the first three quarters of 1950. About 40 names to get together and spend \$100,000.00 according to the TAA's financial report in the Government Register. Rail management, and bidders of railroad equipment such as bidders and insurance companies also contributed liberally. United Air Lines contribution is the only aviation income shown, although in the first three quarters it apparently consolidated \$1000.00 against \$1000.00 as we reported earlier. What better way is there of taking the true measure of an organization than studying its financial of direction. (In the source of its finance)

—Robert H. Wood



"Umbrellas represent one of the first lines of a complete national defense system."

Above, those hundreds of silken parasols by Fairchild planes—the big equipped—make the job smooth in the sky.

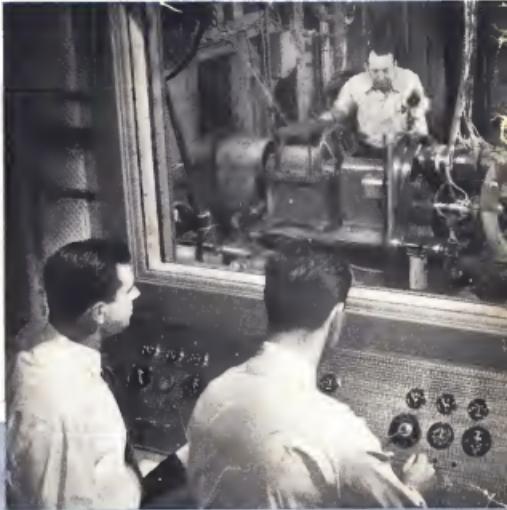
Fairchild leading in the development of mobile airfields is now flying a vital part in the vast production mobilization program. Like the atomic bombs, the L-102 Falter she

l-110 Impaired C-47s and C-120 Transport and the C-130 Transportable Fielder Transport are parts of the United States Armed Forces Team.

Only this type of combination between air and ground crews could have given the word "Airlift" so much meaning. Whether it is generators for the lights of Berlin, trucks grazing high-trained paratroopers for Korean, tank killer Airplanes are ready, willing and able to deliver the goods. Nowhere in the art of war has ahead

FAIRCHILD Aircraft Division

Flight testing an idea



Complete electrical systems for any given aircraft can
be simulated on this network analyzer.

Radial-type engines help this test stand duplicate
aircraft power systems for testing purposes.

Even ideas are flight tested at General Electric. Both before and after an aircraft electrical system is built, G-E's aviation divisions check it out under actual operating conditions to save you expensive "de-bugging."

Your power distribution system, for example, is first "flown" on the analyzer. Electrical circuits for your plane are cranked into the board and the idea is worked over until the analyzer OKs it.

A model then gets a long rugged workout in the Aircraft Systems Test Lab to iron out final kinks. When design is "right," production begins. Finally, individual component parts are tested before installation in your aircraft.

Project engineers are chosen for experience as well as scientific "know-how." Pilots, navigators, flight engineers, military and transport, are represented. George Phillips, for instance, shown "flying" a distribution network, is an ex-Air Force maintenance officer.

This combination of theoretical analysis and practical testing by men who know aviation problems means trustworthy electrical systems without extensive "de-bugging" after installation.

For aircraft electrical equipment that will give you long trouble-free service, call your General Electric aviation specialist or write Apparatus Dept., General Electric Company, Schenectady, N. Y.



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